

DUCKTRAP BRIDGE
(State Bridge No. 2235)
U.S. Route 1 over Ducktrap River
Lincolnton
Waldo County
Maine

HAER No. ME-62

HAER
ME
14-LINC,
2-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Northeast Region
Philadelphia Support Office
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106

HISTORIC AMERICAN ENGINEERING RECORD
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Location: U.S. Route 1 over Ducktrap River
Lincolntonville
Waldo County, Maine

UTM 19.499530.4904720
USGS Quad: Lincolntonville, Maine, 1:24,000

Dates of Construction: 1919-20 (lower bridge)
1932-33 (upper bridge)

Engineer: L. B. Jones, engineer (1919)
unknown (1932)

Present Owner: State of Maine
Department of Transportation
Augusta, Maine 04333-0016

Present Use: Two-lane highway

Significance: The construction of this bridge is unique in Maine as it consists of two bridges, one built on top of the other to accommodate a change in grade of the highway. The first bridge, designed in 1919, is a through deck reinforced concrete structure. The second bridge, designed in 1932, is a reinforced concrete T-beam structure with open spandrel arches erected on the deck of the 1919 bridge. The 1932 bridge forms a second tier and suggests the appearance of a Roman aqueduct. The unknown designer(s) found a solution to adapt an existing bridge to meet the requirements for raising the grade of a major highway while creating one of the most unusual engineering monuments in the state.

Project Information: The Ducktrap Bridge is scheduled to be replaced under a Federal Highway Administration/Maine Department of Transportation federally funded project. To mitigate this adverse effect, the State Historic Preservation Office stipulated documentation of the existing bridge. This documentation was undertaken to fulfill this stipulation.

Roger G. Reed, Architectural Historian
19 Terrace Avenue
Newton, Massachusetts 02161

Narrative Description of the Ducktrap Bridge:

The Ducktrap River derived its name from the Indians who hunted here. The tidal basin formed at the mouth of the river that was known as, "the Trap" because large numbers of ducks tended congregate at this location. It is not recorded when this name was translated into English, though the first permanent settlements in the late 18th century were called the plantations of Canaan and Duck Trap. The population totaled 278 in 1799 and was supported by farming, fishing and lumbering.

The Town of Lincolnville, including the Plantations of Canaan and Duck Trap, was incorporated in 1802. Two Revolutionary War veterans, George and Phillip Ulmer, moved to Duck Trap from Lincolnville and constructed substantial brick houses on the hilly terrain above the river. General George Ulmer's house still stands on the east side of the river, while his brother Phillip's dwelling occupied a site on the west side that is no longer extant. George Ulmer constructed a dam upstream from the bridge to power his mills. Above the dam he built a log boom to collect lumber for the saw mill.

Another important industry was the lime kiln located on the Trap just downstream from the bridge. Copper shops which fabricated the barrels to transport the lime were situated adjacent to the bridge on its north side. Much of this industry was established by a third settler, Samuel Whitney, who exported timber, boards and shingles to the West Indies, and manufactured bricks. He also built ships to transport his goods. Vessels of various sizes were constructed on ways built on the shore of the Trap. None of the structures associated with these early industries survive.

The first record of a bridge at this location was in 1802 when George Ulmer obtained a charter from the Massachusetts legislature to erect a toll bridge. This toll bridge caused considerable local controversy. It was seen as a burden on local inhabitants since most of the dwellings were on one side of the river and most of the business enterprises were on the other. Local histories indicate that more than one bridge was washed away until a more durable timber structure was built in 1821.

It is not known if it was the 1821 bridge that survived until a wood and steel structure was erected in 1908. The only photograph of a timber bridge (*Ducktrap: Chronicle of a Maine Village*, p. 13) shows a two span timber structure on rubble stone abutments. Each span has a king post truss and railings of split wood. The trusses were braced by struts notched into timber girders providing support transversely under the deck of the bridge. The 1908 bridge was the first effort to improve the crossing by building up the roadway at its approaches to the river. With its construction a greater clearance was gained over the river. The new bridge consisted of abutments of rough split stone supporting steel girders on a wood deck. The railing was wood and appears to have been more substantial than on the earlier structure. The built-up roadway around the bridge coincided with the decline of commercial uses at the mouth of the Ducktrap River.

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The 1908 bridge was constructed prior to the advent of heavy motor-car traffic to the summer colonies along the Maine coast. At the turn-of-the-century most of the summer visitors from out of state traveled by train and steamboat. The Town of Lincolnville, although half-way between Camden and Belfast where there were steamboat docks, was not on a major thoroughfare. After the first World War, however, automobile travel was more common and the need for an improved coastal road became important. This was dramatically demonstrated in 1918 when a bus traveling between Belfast and Camden crashed through the wood railing at the Ducktrap Bridge and plunged into the water, killing one person. The steel girder bridge had not been in good condition. According to an undated highway department report, one abutment of the bridge was displaced by spring floods. It was due to these circumstances that the decision was made to build a new bridge.

Costs of the new bridge were to be shared by the Town of Lincolnville, the County of Waldo, and the State of Maine. The plans for the bridge in the Maine Department of Transportation indicate that the drawings were prepared by state highway engineers. Only the sheet for the abutments was site specific for the Ducktrap Bridge. The other two sheets provided detailed drawings for a reinforced concrete bridge deck with a 55' span and pre-cast concrete railings. Work began on July 25, 1919, by the Cyr Brothers of Waterville, contractors. For reasons not known, completion was delayed until the following year and the bridge was not finished until October 1, 1920. The cost was \$19,132 for the contractor and \$1,241 for engineering, advertisements, and inspections. Half the cost was borne by the state, while the county paid 30% and the town incurred 20%. As evidenced by the standardized reinforced concrete drawings for the bridge, the choice of this material was not unusual in Maine at that time. Photographs of the completed structure taken in 1920 show an absence of industrial structures in the vicinity of the bridge.

Plans were made to improve Route 1 through the Town of Lincolnville in 1932 with a bituminous macadam surface, 20' wide with 3' shoulders. Route 1 had been established as a highway in the early 1920s. By 1931 road re-surfacing projects were being undertaken from Camden to Lincolnville. As part of these road improvements, state engineers decided to rebuild Route 1 where it crossed the Ducktrap. Rather than maintain the existing steep grade down to the river a solution was devised to use the existing bridge and construct a second tier bridge on top of it. This effectively raised the level of the road by another eighteen feet. Based upon available documentation, it appears that the decision to erect the second bridge was made in response to rebuilding the road rather than the need for a new crossing of the Ducktrap River. Although the contract for the road resurfacing was put out to bid, work on the new bridge was done using workmen hired by the day as needed. The cost for labor and materials was \$38,283. Engineering and supervision costs were \$3,063. No information has come to light indicating who designed the bridge. Presumably, it was an employee of the Bridge Division, Maine State Highway Commission. Work on the road resurfacing began on May 26, 1932, and a temporary bridge over the Ducktrap was under construction in mid-June. The new concrete bridge was largely completed and opened to traffic on November 23, 1932, although with temporary railings. Concrete railings were not built until the spring of 1933.

Bridge Descriptions:

The construction of earlier bridges on the site had resulted in a built-up roadway where the Ducktrap River emptied into the Trap. At either end of the 1919 bridge were concrete and stone abutments. The facing of the 11'6" high abutments was split granite blocks with ½" joints. These were laid upon 6' high concrete footings. Resting on top of the abutments were concrete bridge seats, 1'6" thick, and a concrete back wall 5' high and 1'6" thick. An expansion joint was provided for by making the seat of the east abutment 2' wide and the west abutment 2'1" wide. The sides of the bridge seat were formed by two courses of granite blocks, 4½' high, and a concrete coping stone 1' high. The side walls of the granite abutments extended 31' beyond the bridge to a point where the roadway was supported on embankments of rubble stone.

The length of the 1919 bridge is 58' with a clear span of 55'. There was an over-all width of 23' and clear roadway of 20'. A 1' thick reinforced concrete deck slab was supported on 2' by 2' reinforced concrete longitudinal girders 7' on center and reinforced concrete floor beams, 1'4" running laterally 9'9" on center. The deck was reinforced by iron bars running in two directions at right angles to each other.

The floor slab extended 3'6½" beyond the edge of the longitudinal girders on each side of the bridge. Additional support for these cantilevered ends was provided by concrete brackets reinforced with stirrups. The railings on the bridge were pre-cast concrete formed out of panels with pierced openings. This railing was secured to the bridge deck by dowels. Expansion plates were provided at either end of the railing. The roadway was originally paved.

The 1919 bridge presently serves as a deck to support the second bridge. The railings were removed from the older structure and the abutments were rebuilt at the outer ends. The two ends of the new bridge were constructed with reinforced concrete piers driven into 6' concrete footings. A new 12-10 slope of riprap was built up around each end of the bridge.

Vertical reinforced concrete piers were built on the deck of the old bridge and its abutments to create three new T-beam spans, 60' long for the center span and 27' long at either end. The bridge consists of a series of reinforced concrete piers supporting reinforced concrete girders (called "bents"). Each bent, numbered 1 through 17, consists of two or three piers in a row. The round arches are entirely decorative in function.

As described on the original plans, the following procedure was employed to construct the bridge:

To insure no dead or live load being transmitted to the present span the following method of construction is to be pursued. The bases of columns 7-8-9-10-11 (over the large center span) are to be placed first, with an insulated joint of 1/4" felt at their top. The shafts are placed next. The super-structure is next placed, supported on its falsework. After the falsework is removed and the span has taken its dead load settlement, the caps of the columns [at the spring of the arches] are placed with an insulated joint at their top of 1/4" felt. Bents 3-6 and 12-15 [the two sections comprising the short spans] together with the spans connecting them and columns are built as a monolith with as few construction joints as possible, and thoroughly doweled.

Bent #12, the east end of the large center span, is firmly anchored to the short span at that end. Bent #6, at the west end of the large span, rests on bronze expansion plates where it joins the short span at that end.

The bridge deck over the center span is supported on reinforced concrete girders providing both transverse and longitudinal support. As with the 1919 bridge, the two sides of the bridge are cantilevered and supported on reinforced concrete brackets. The width of the bridge is 27' with a clear roadway of 24'. A 4' sidewalk extends along the north side of the bridge, which requires the cantilever railing to extend an additional 4' on that side. The railing is cast in place concrete reinforced with steel. The vertical steel bars were installed in the supporting girders, then the railing was cast in place and anchored to the bridge.

The bridge has not undergone any significant changes since its construction. In 1948 the rip rap was replaced, and in 1951 the sidewalk was patched and new wire guard rails installed for the wings. Additional cedar guard rails were added in 1955. The sidewalk and curbs were replaced in 1962. The most substantial repairs to the bridge were made in 1977. At that time repairs were made to the rip rap, the sidewalk, the concrete railing, and the abutments. The drains were also cleaned.

There is considerable spalling of the reinforced concrete, particularly in the areas above the cast in place arcading on either side of the bridge. The railing is intact, but the exposed aggregate near the surface is evidence that the surfaces of the bridge have not been refinished recently.

Sources of Information/Bibliography:

- A. Engineering drawings: There are three sheets of drawings for the Ducktrap Bridge dated 1919, and seven sheets dated 1932. Copies of these drawings are stored in the archives of the Maine Department of Transportation, and have been reproduced for inclusion in the Photographic Documentation Section.
- B. Historic Views: Several historic photographs of the bridge site and its immediate surroundings have been published in the local histories, cited below. These photographs include views of the last timber frame bridge over the Ducktrap, as well as the 1908, 1919 and 1932 bridges. The Maine Department of Transportation has numerous historic views taken just prior, during and after construction of both the 1919 and 1932 bridges. Several of these views are included in the Photographic Documentation section of this report.

C. Bibliography:

1. Primary and unpublished sources:

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Republican Journal (Belfast, Maine), December 8, 1932.

2. Secondary Sources:

Goodyear, Sarah, "A Doomed Landmark?," *Down East Magazine*, March 1995, p. 33-35.

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Maine State Highway Commission. *Annual Reports*. Augusta, Maine, 1919, 1920, 1930-1933.

O'Brien, Diane. *Ducktrap: Chronicle of a Maine Village*. Lincolnville Historical Society, 1984.

3. The following books and journals were examined:

Concrete Highways and Public Improvements, Chicago, 1931-August, 1932 (Journal ceased publication).

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Ketchum, Milo S., *The Design of Highway Bridges of Steel, Timber and Concrete*. New York: McGraw Hill, 1920.

Taylor, Frederick W., Thompson Sanford E., Smulki, Edward, *Reinforced-Concrete Bridges*. New York: John Wiley & Sons, 1939.

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Site plan provided by Maine Department of Transportation, October, 1996

